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EXAMINER	
WU, JIANYE	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/780,262	QIU ET AL.	
	Examiner	**Art Unit**	
	Jianye Wu	2416	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/24/2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20 and 23-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20 and 23-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments/Amendments

1. Applicant's arguments filed on 3/24/2009 have been fully considered, but are not persuasive.

2. For claim 23-25, applicant argues:

a) "In Chow, locations of the nodes have already been determined and the links between the nodes are selected by a designer" (page 17, 1st full paragraph);

b) "claim 23-25 include a limitation on determining whether the first equivalence class and the second equivalence class covering the same locations" and "The Examiner does failed to provide documentary evidence" (page 17, 2nd full paragraph).

In response, Examiner respectfully disagrees

a) Chow teaches network simulation. It explicitly discloses adding possible links in FIG. 7. As acknowledge by Applicant that the locations of the nodes are selected by a designer, and they can be in any places that the designer considers to be suitable. There is nothing in Chow states that the location of the nodes could not be changed. In fact for the simulation purposes, the designer often moves around the location of a node until the optimal location is found for the system.

b) Examiner did provide the documentary evidence to support the Examiner's position by citing Chow (Col. 2, lines 47-58) in the Office Action.

3. For independent claims 1 and 16-20, Applicant's arguments are moot since these independent claims have been amended. Please see new rejections to the amended claims in the following for details.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. **Claims 1-2, 9, 16** and **23-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US 6771966 B1, hereinafter **Chow**) in view of Ayyagari et al. (US 20020101822, hereinafter Ayyagari).

For **claims 1** and **16**, Chow discloses a method and a computer-readable storage medium for determining placement locations of internet taps (ITAPS) in network (determining and providing “node site information”, col. 20, line 61-62 and FIG. 12, including adding new nodes to networks as shown in FIG. 17), comprising:

accepting connectivity information for the network (accepting “node site information provided”, col. 20, line 61-62 in view of FIG. 7), the network being a multi-hop wireless mesh network employing a MAC protocol (MAC sub-layer of nodes in the network as every node in a radio network has a MAC sub-layer, and all MAC sub-layer

are connection-based with radio links, as shown in FIG. 17) and comprising nodes and links between the nodes, the connectivity information (FIG. 7, shows the connectivity information of existing nodes and links [solid lines]), each ITAP in the set of potential ITAPs to be open having a placement location (suggested by “node site information provided”, col. 20, line 61-62 in view of FIG. 7);

iterating through the set of potential ITAPs to be opened (iterative process, col. 9, lines 66-67);

selecting an ITAP, from the set of potential ITAPs (selecting links, col. 10, line 64) to be opened, to be added to a set of currently open ITAPs (the existing nodes on the network), wherein the selected ITAP increases the node demands satisfied when opened together with ITAPs in the set of currently open ITAPs (make selection using the iterative process described in col. 9, lines 66-67);

adding the selected ITAP to the set of currently opened ITAPs (add the node selected by the iterative process described in col. 9, lines 66-67);

repeating the iterating, selecting, and adding until all the node demands are satisfied (“to provide the best set of radio links or radio topology … repeated until … is satisfied”, col. 9, lines 48-67); and

implementing each ITAP in the set of currently opened ITAPs in the network at its respective placement location (for each desired location of the ITAP in the set of the selected nodes, implementing by the iterating process above).

Chow is **silent on** that the MAC is the contention-based MAC.

In the same field of endeavor, Ayyagari et al. (US 20020101822) discloses Ethernet ([0005]) that has a the contention-based MAC based on IEEE 802.3, which is also used by most wireless communication protocols. Ayyagari further discloses that a wireless network comprises multiple nodes and links (wireless network shown in Fig. 3 or in Fig. 7) whose connectivity information comprises link capacity constraints (“link’s capacity”, [0058]), node capacity constraints (“the capacity allocated to each node”, [0025]), and node demands for flow (“node demands a higher share of the bandwidth”, [0071]); One skilled in the art would apply the ITAP placement method disclosed by Chow to the multi-hob wireless network disclosed by Ayyagari as suggested by Chow in claim 1 for the benefit of achieving minimized interference (col. 3, line 20-24 of Chow).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use contention-based MAC and the performance and capacity analysis techniques disclosed by Ayyagari in the ITAP placement planning disclosed by Chow to ensure the planned network to have sufficient performance and capacity to meet desired requirement.

As to **claim 2**, Chow in view of Ayyagari discloses the method of claim 1, Chow further discloses the selecting is repeated until the set of potential ITAP (suggested by “new links may be established”, col. Line xx-xx) to be opened is exhausted and the potential ITAP is the potential ITAP which maximizes the node demands satisfied (“the iterative process is repeated until the engineer is satisfied with the layout", col. 9, lines 66-67).

As to **claim 9**, Chow in view of Ayyagari discloses the method of claim 1, Chow further discloses the potential ITAP (new node or links to be added) selected is the first potential ITAP which increases the node demands satisfied (“the iterative process is repeated until the engineer is satisfied with the layout", col. 9, lines 66-67). This is a broader version of claim 2.

For **claims 23** and **25**, a method and computer-readable storage medium containing instructions for reducing potential placement locations of internet taps (ITAPs) in a multi-hop wireless mesh network by identifying equivalence classes of nodes in the network which may be serviced by the same ITAP, the method comprising:

accepting equivalence class information for the network;

determining whether a first equivalence class is covered by a second equivalence class; and

eliminating the first equivalence class from consideration as a potential placement location for an ITAP if the first equivalence class is covered by the second equivalence class.

Chow teaches selecting desired location for ITAP in order to increase the coverage of service area (Col. 2, lines 47-58). If “a second equivalence class” in the claim is interpreted as a chosen class whose location is selected already, what the claim teaches is to eliminate a location for an ITAP that can not provide service for more nodes, which is general knowledge in the art and is obvious to an person with ordinary skill in the art since selecting such a location would not increase the network coverage

area, therefore, would not result in any benefits. Therefore, the claim is rejected since it is disclosed by general knowledge in the art.

As to **claim 24**, it is rejected for the same reason as explained in claim 23 because it simply repeats the steps defined in claim 23.

6. **Claims 3** and **10** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow in view of Ayyagari, further in view of Bush et al. (US 2004/0250128 A1, hereinafter Bush).

As to **claim 3** and **10**, Chow in view of Ayyagari discloses the method of claim 2 and 9, and further teaches selecting ITAPs by computing corresponding max-flows of the network when the ITAPs are added to the network in different ways, including:

creating a subgraph (Fig. 7) induced on a set of nodes, a set of currently opened ITAPs (solid nodes in Fig. 7), and a potential ITAP (705 of Fig. 7) to be opened;

adding a source node, the source node having edges of capacity equal to the demand of the transformed node from the source to each node in the network; adding a destination node, the destination node having edges of capacity equal to the capacity of each currently opened ITAP and the potential ITAP to be opened, from each currently opened ITAP and the potential ITAP to be opened to the destination node; and computing the maximum flow from the source node to the destination node. (This limitation is inherent for calculating max-flow of between 2 given mobile terminals via a network. To calculate the max flow between 2 given mobile terminals via a network, one

has to add the two nodes with one for each mobile terminal to the topology of the network, then calculate the max flow between the 2 nodes).

Chow in view of Ayyagari is **silent on** transforming each node's capacity constraint to an edge capacity constraint by replacing each node with a first node and a second node, the first node accepting all incoming edges to the transformed node and all outgoing edges from the transformed node originating from the second node, and creating a directed edge, having the node's capacity, from the first node to the second node.

Directed graph are often used in network analysis which include capacity modeling and flow control, such as taught by Bush in determining max-flow (maximum flow analysis, [0040], line 1-2) of directed graph ([0036] and FIG. 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chow with Bush in using directed subgraph for computing the max-flow of the network in order to use network efficiently.

7. **Claims 4, 7-8, 11** and **14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow in view of Lee et al. (US 2003/0099194 A1, hereinafter Lee).

As to **claim 4**, Chow discloses the method of claim 2 wherein the selecting of the ITAP, from the set of potential ITAPs to be opened, which maximizes the node demands satisfied (col. 9, lines 66-67), but is **silent on** including: developing a linear program to compute maximum demands satisfied in the wireless neighborhood network by opening the selected ITAP in conjunction with the set of currently opened ITAPs,

wherein the linear program treats throughput of a connection as independent of path length;

modifying the linear program to ensure that flow from each node is served by independent paths;

modifying the linear program to multiply the node demand by the number of independent paths;

modifying the linear program to multiply the capacity constraints by a ratio of an over-provisioning factor to the number of independent paths; and

solving the resulting linear program.

However, the above limitations are common procedure of solving a max-flow problem ([0040], line 8-9) using linear programming, which is well known to persons skilled in the art as suggested by Lee ([0040], line 8-14).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chow with Lee for computing the max-flow of the network in order to use network efficiently.

As to **claim 7**, Chow discloses the method of claim 2 wherein the selecting of the ITAP, from the set of potential ITAPs to be opened, which maximizes the node demands satisfied (col. 9, lines 66-67), but is **silent on** the method including:

developing a linear program to compute maximum demands satisfied in the wireless neighborhood network by opening the selected ITAP in conjunction with the set of currently opened ITAPs, wherein the linear program treats throughput of a connection as a function of a number of hops the connection traverses ([0003]);

denoting an amount of flow routed through an edge based on a position of the edge along a path;

modifying the linear program to limit the maximum flow from each node; and

solving the resulting linear program.

However, the above limitations are common procedure of solving a max-flow problem ([0040], line 8-9) using linear programming, which is well known to persons skilled in the art as suggested by Lee ([0040], line 8-14).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chow with Lee for computing the max-flow of the network in order to use network efficiently.

As to **claim 8**, Chow discloses the method of claim 2 wherein the selecting of the ITAP, from the set of potential ITAPs to be opened, which maximizes the node demands satisfied comprises:

developing a linear program to compute maximum demands satisfied in the wireless neighborhood network by opening the selected ITAP in conjunction with the set of currently opened ITAPs, wherein the linear program treats throughput of a connection as a function of a number of hops the connection traverses;

modifying the linear program to ensure that flow from each node is served by independent paths (e.g., [0066]);

modifying the linear program to multiply the node demand by the number of independent paths (e.g., [0066]);

modifying the linear program to multiply the capacity constraints by a ratio of an over-provisioning factor to the number of independent paths (e.g., [0098]); and

solving the resulting linear program.

However, the above limitations are typical techniques of applying common procedure of solving a max-flow problem using linear programming, which is well known to persons skilled in the art as suggested by Lee ([0040], line 8-14)

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chow with Lee for computing the max-flow of the network in order to use network efficiently.

As to **claims 11** and **14-15**, they are rejected for the same reasons as explained in claims 4 and 7-8, respectively because claims 4 and 7-8 include all limitations of claims 11 and 14-15.

8. **Claims 5-6** and **12-13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow in view of McGlade, Bryan J. (US 6411598 B1, hereinafter McGlade).

As to **claim 5**, Chow discloses the method of claim 2 wherein the selecting of the ITAP, from the set of potential ITAPs to be opened, which maximizes the node demands satisfied comprises satisfied (col. 9, lines 66-67), but is **silent on** the method including:

finding the shortest path from demand points to opened ITAPs;

routing one unit of flow along the shortest path; decreasing capacities of edges on the path by one; and

repeating the finding, routing, and decreasing until the shortest path found has a length greater than a hop-count bound.

McGlade teaches finding a shortest path (Col. 13, line 5) in terms of hop-count (Col. 13, line 4-6). Since an ITAP can either be considered as a node, or as a part of a node, the technique of finding a shortest path in general networks can be applied to networks with ITAPs.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chow with McGlade for computing the max-flow of the network in order to use network efficiently.

As to **claim 6**, Chow discloses the method of claim 2 wherein the selecting of the ITAP, from the set of potential ITAPs to be opened, which maximizes the node demands satisfied (col. 9, lines 66-67), but is **silent on** the method including:

finding a shortest path from demand points to opened ITAPs;

routing one unit of flow along the shortest path; decreasing capacities of edges on the path by one;

repeating the finding, routing, and decreasing until no path between any demand point and any open ITAP remains; and

computing a demand satisfied along each path according to a throughput function.

McGlade teaches finding the shortest path (Col. 13, line 5) and computing the max flow (Col. 17, line18-20) along the path. Since an ITAP can either be considered as

a node, or as a part of a node, the technique of finding a shortest path in general networks can be applied to networks with ITAPs.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Chow with McGlade for computing the max-flow of the network in order to use network efficiently.

As to **claims 12-13**, they are rejected for the same reasons as explained in claims 5-6, respectively, because claims 5-6 include all limitations of claims 12-13.

9. **Claims 17-18** and **19-20**are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow in view of Ayyagari, further in view of Szymanski et al. (US 2004/0088148 A1, hereinafter Szymanski).

For **claims17-18** and **19-20**, Chow discloses a method and a computer-readable storage medium for determining placement locations of internet taps (ITAPS) in network (determining and providing "node site information", col. 20, line 61-62 and FIG. 12, including adding new nodes to networks as shown in FIG. 17), comprising:

accepting connectivity information for the network (accepting "node site information provided", col. 20, line 61-62 in view of FIG. 7), the network being a multi-hop wireless mesh network employing a MAC protocol (MAC sub-layer of nodes in the network as every node in a radio network has a MAC sub-layer, and all MAC sub-layer are connection-based with radio links, as shown in FIG. 7) and comprising nodes and links between the nodes, the connectivity information comprising link capacity constraints, node capacity constraints, node's maximum demands [claim 19-20] for flow,

a set of potential ITAPs to be open (FIG. 7, shows the connectivity information of existing nodes and links [solid lines], in view of col. 30, line 20-45, “to maximize the use” network resources, including meeting the maximum demands of a node for flow), each ITAP in the set of potential ITAPs to be open having a placement location (suggested by “node site information provided”, col. 20, line 61-62 in view of FIG. 7);

iterating through the set of potential ITAPs to be opened (iterative process, col. 9, lines 66-67);

selecting an ITAP, from the set of potential ITAPs (selecting links, col. 10, line 64) to be opened, to be added to a set of currently open ITAPs (the existing nodes on the network), wherein the selected ITAP increases the node is satisfied when opened together with ITAPs in the set of currently open ITAPs (make selection using the iterative process described in col. 9, lines 66-67);

adding the selected ITAP to the set of currently opened ITAPs (add the node selected by the iterative process described in col. 9, lines 66-67), wherein each node’s demand is the node’s maximum demand;

repeating the iterating, selecting, and adding until all the node demands at all time intervals are satisfied (“to provide the best set of radio links or radio topology … repeated until … is satisfied”, col. 9, lines 48-67); and

implementing each ITAP in the set of currently opened ITAPs in the network (for each ITAP in the set of nodes selected, implementing by the iterating process above).

Chow is **silent on** that the MAC is the contention-based MAC; and the iteration is done through a set of time intervals.

In the same field of endeavor, Ayyagari et al. (US 20020101822) discloses Ethernet ([0005]) that has a the contention-based MAC based on IEEE 802.3, which is also used by most wireless communication protocols. Ayyagari further discloses that a wireless network comprises multiple nodes and links (wireless network shown in Fig. 3 or in Fig. 7) whose connectivity information comprises link capacity constraints ("link's capacity", [0058]), node capacity constraints ("the capacity allocated to each node", [0025]), and node demands for flow ("node demands a higher share of the bandwidth", [0071]); One skilled in the art would apply the ITAP placement method disclosed by Chow to the multi-hob wireless network disclosed by Ayyagari as suggested by Chow in claim 1 for the benefit of achieving minimized interference (col. 3, line 20-24 of Chow).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use contention-based MAC and the performance and capacity analysis techniques disclosed by Ayyagari in the ITAP placement planning disclosed by Chow to ensure the planned network to have sufficient performance and capacity to meet desired requirement.

Chow in view of Ayyagari does not explicitly disclose iterating through a set of time intervals.

In the same field of endeavor (network simulation), Szymanski discloses iteration over time interval ([0027], network simulation takes time interval as a iteration parameter, as suggested by "the first simulated interval" and "in the simulation time interval"). From mathematical point of view, iterating process may use any set of

parameters for iteration, including the time interval in additional to network parameters such as links and nodes.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to Chow in view of Ayyagari with Szymanski to iterate over time intervals for optimization.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jianye Wu whose telephone number is (571)270-1665. The examiner can normally be reached on Monday to Friday, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on (571)272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jianye Wu/

Examiner, Art Unit 2416

/Seema S. Rao/
Supervisory Patent Examiner, Art Unit 2416